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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/398,006
Filing Date: September 16, 1999
Appellant(s): OKAMOTO ET AL.

MAILED

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GROUP 1700

Raja Saliba
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed March 24, 2005.

JLL

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

(A) Listing or Prior Art of Record

GB 1,783,0453	FARNSWORTH	8-1977

US 5,591,284	GAUDIN	1-1997
US 5,968,295	KOHNO	10-1999
US 5,779,828	OKAMOTO	7-1998
US 3,913,652	IMAMURA	10-1975

(B) Brief Description of Prior Art of Record

Farnsworth teaches a pneumatic, radial tire construction having a three-ply belt structure formed of steel reinforcing elements. In the preferred embodiment, the cords of the radially outermost belt ply have an inclination angle between 40 and 70 degrees with respect to the equatorial plane of the tire and the cords of the radially innermost and intermediate belt ply have an inclination angle between 10 and 25 degrees with respect to the equatorial plane of the tire (Page 1, Lines 55-70).

Gaudin is directed to a tire having a multi-ply belt construction and broadly teaches that it is desired to stagger the ends of belt plies in order to eliminate the buildup of stresses (Column 1, Lines 35-40). The reference further discloses each of the six possible belt constructions in Figures 6-11 (for a three-ply belt structure) and suggests that they represent alternative assemblies that provide sufficient reinforcement (Column 2, Lines 24-26 and Column 3, Lines 35-37).

Kohno is similarly directed to a tire having a multi-ply belt construction. In this instance, the reference teaches the use of a high modulus coating rubber for a radially outermost belt layer formed of steel cords in order to prevent the cords of this belt layer from moving and causing local buckling of said cord (Column 4, Lines 47-55)- this

benefit is directly analogous to that described by the claimed invention (Page 9, 2nd Paragraph).

Okamoto recognizes the conventional use of wavy end cover rubbers (in belt plies) in order to prevent belt end separation (analogous to eliminating the buildup of stresses). Additionally, the use of such a wavy end cover rubber provides reinforcement in both the radial and axial direction, further reducing the occurrence of "belt end separation", which is a desirable property in all pneumatic tire constructions.

Imamura recognizes the conventional use of end cover rubbers (in belt plies) in which said rubber is joined to a widthwise outer end face of the cord layer over a full periphery of the cord layer (Figure 1C). This particular type of end cover rubber represents one of many conventional such rubbers used to prevent "belt end separation".

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 3-5, 24, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnsworth in view of Gaudin and Kohno.

Farnsworth, as best depicted in Figure 1, substantially teaches the pneumatic tire construction of the claimed invention, including a belt assembly formed of a radially innermost steel belt layer 4, a middle steel belt layer 3, and an outermost, high angled steel belt layer 2, that is narrower than the radially innermost steel cord layer. In

describing the axial extent of the belt assembly as a whole, Farnsworth suggests that said belt assembly has a maximum axial width between 90 and 110% of the axial width of the tread (Page 1, Lines 94-96). Although Farnsworth fails to depict the inclusion of tread grooves, one of ordinary skill in the art at the time of the invention would have expected the tire of Farnsworth to contain a plurality of tread grooves as is conventional in pneumatic tires and furthermore, in view of the above noted range (disclosed width of belt), one would have expected the outer ply to extend outward of the outermost tread groove (grooves are positioned axially inward of the axial outermost end of tread). As to the axial widths of the respective plies, while Farnsworth fails to expressly require the outermost ply have an intermediate width (in relation to inner and middle ply), a fair reading of Farnsworth suggests that a wide range of belt assemblies having varying widths is within the scope of Farnsworth- in particular, the reference places no criticality on which belt ply is the widest or the narrowest, as evidenced by Figures 1-3C. As such, one of ordinary skill in the art at the time of the invention would have found it obvious to form the outer ply narrower than the innermost ply and wider than the middle ply, there being no conclusive showing of unexpected results to establish a criticality for this relationship. It is particularly noted that it is well-known in the tire industry to stagger the ends of belt plies in order to avoid the buildup of stresses, as shown for example by Gaudin (Column 1, Lines 35-45) and furthermore, it is known in the tire industry that any of a wide number of belt arrangements having varying axial widths provide a suitable belt construction (Column 2, Lines 24-32 and Figures 6-11). It is emphasized that the belt construction of Gaudin depicted in Figures 6-11 is extremely

similar to that of Farnsworth in that three steel plies are included. Lastly, regarding the compression modulus of the coating rubber, one of ordinary skill in the art at the time of the invention would have readily appreciated the broad range of the claimed invention (greater than **200 kgf/cm^2**) as defining extensively used coating rubber compositions in similar belt plies. Kohno, for example, is directed to a similar tire construction having an outermost belt layer that can be formed of steel in which the coating rubber has a compression modulus greater than **200 kgf/mm^2** in order to prevent the cords of this belt layer from moving and causing local buckling of said cord (Column 4, Lines 47-55). Thus, Kohno suggests a minimum value for the compression modulus that is **100 times greater** than that required by the claimed invention, such that one of ordinary skill in the art at the time of the invention would have readily appreciated the claimed range of "at least 200 kgf/cm^2". It is further noted that applicant similarly attributes the benefits of reducing buckling fatigue to the inclusion of a coating rubber having a compression modulus of at least 200 kgf/cm^2 (Page 9, 2nd Paragraph). As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the coating rubber of the outermost layer of Farnsworth with a compression modulus of at least 200 kgf/cm^2 as such a construction is extensively used in the outermost belt plies formed of steel for the benefits detailed above, as shown for example by Kohno.

It is initially noted that Gaudin clearly evidences the common structure in which the belt plies extend beyond the axially outermost tread groove.

Regarding claims 1, 3-5, 24, and 25, Farnsworth depicts multiple embodiments in which the high angled layer is the outermost layer (Figures 1, 3B, and 3C). While no

single embodiment depicts the high angled layer as being both narrower than the innermost layer and wider than the middle layer, it is clearly evident that Farnsworth places no criticality on the axial extent of the outer, high angled layer in relation to the inner and middle layers, only stating that the maximum axial width of the belt assembly (as a whole) is in the range of 90 to 110% of the tread width. The specific selection of an embodiment in which the high angled layer is wider than the middle layer and narrower than the innermost layer would have been within the purview of one of ordinary skill in the art at the time of the invention, particularly since it is well known to stagger the ends of belt plies so stresses do not buildup at the ply ends. Gaudin has been additionally applied to expressly evidence this point and furthermore, to illustrate the use of a variety of suitable, belt configurations in regards to the width of the respective plies. In order to satisfy the claimed invention, for example, the inner layer in either Figure 3B or 3C would have to be extended beyond the outer layer or the outer layer in Figure 1 would have to be extended beyond the middle layer. Thus, since Farnsworth describes a plurality of embodiments in which the axial extent of the respective plies is axially varied and Farnsworth fails to suggest a criticality in any specific arrangement, it would have been obvious to one of ordinary skill in the art at the time of the invention to form a belt assembly as defined by the claimed invention, there being no conclusive showing of unexpected results to establish a criticality for this arrangement.

As to the limitation requiring the outermost layer be between 1.0 and 1.2 times the axial width of the middle cord layer, both Figures 3b and 3c of Farnsworth depict a

construction in which the high angled layer covers the middle cover and contains an axial width that is slightly staggered outward of the end of the middle cord layer. One of ordinary skill in the art at the time of the invention would have recognized that the amount of staggering is on the order of a couple of millimeters and well within the broad range of values that allows up to a 20% staggering. It is further noted that Farnsworth states that the tread width is on the order of 185 to 200 millimeters. Thus, a middle cord layer might have an axial width of approximately 150 millimeters- this allows for an outermost layer to have an axial width of up to 180 millimeters. It is evident that the range of the claimed invention is broad and defines embodiments that are consistent with a plurality of tire designs. **Also, in regards to the data beginning on Page 54, Table 2 can only show that improved cut resistance is obtained by providing an outermost ply having a width greater than the position of the groove under which the property is measured- the table does not provide a showing of unexpected results for the outermost ply having a width between 1.0 and 1.2 times the width of the middle ply**. This is to be expected since one would not expect improved resistance if the relevant reinforcement layer (outermost belt layer) does not even extend beyond the point under which a given property is measured (as is the case in Comparative Examples 7 and 8). In fact, Examples 15 and 16 result in the best cut resistance- in these examples, though, the outermost cord layer has a width that is actually smaller than the middle cord layer (same structure as Figure 1 of Farnsworth).

Regarding claim 5, applicant requires that the cord to cord distance between the end of the middle cord layer and the adjacent outermost cord layer is greater than 0.15

times the cord to cord distance between the same end of the middle cord layer and the adjacent inner layer. A fair reading of Farnsworth as a whole suggests that the relevant distances would be approximately the same, as would be expected by one of ordinary skill in the art at the time of the invention. Thus, the cord-to-cord distance (defined by topping rubbers) between the middle cord layer the outermost cord layer would be approximately 1.0 times the cord-to-cord distance between the middle cord layer and the inner cord layer.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnsworth, Kohno, and Gaudin as applied in claim 1 above and further in view of Okamoto.

As previously mentioned, the combination of references teaches or suggests all the limitations of claim 1. The references, however are silent with respect to the employment of an end cover rubber having a wavy surface in accordance to the limitations of the claimed invention (peak to trough distance of between 0.05 and 0.25 mm). In any event, a variety of end cover rubbers are conventionally used in the ends of breaker or belt layers to prevent "belt end separation". Okamoto describes a specific type of end cover rubber in the belt region having a wavy surface and a peak to trough distance of between 0.05 and 0.25 mm, which mimics the range outlined by the claimed invention (Column 8, Lines 53-61). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the specified wavy end cover rubber, as suggested by Okamoto, in the general tire construction of either one of Bourdon or

Farnsworth. The use of such a wavy end cover rubber provides reinforcement in both the radial and axial direction, further reducing the occurrence of "belt end separation", which is a desirable property in all pneumatic tire constructions.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnsworth, Kohno, and Gaudin as applied in claim 1 above and further in view of Imamura.

As previously mentioned, the combination of references teaches or suggests all the limitations of claim 1; however, the references are silent with respect to the use of end cover rubber that is joined to a widthwise outer end face of the cord layer over a full periphery of the cord layer, as depicted in Figure 11. In any event, as stated in the previous paragraph, a variety of end cover rubbers are conventionally used in the ends of breaker or belt layers to prevent "belt end separation". Furthermore, Imamura depicts multiple arrangements of conventional end cover rubbers, including an embodiment in which the end cover rubber is joined to a widthwise outer end face of the cord layer over a full periphery of the cord layer (Figure 1C). In describing the width of the end cover rubber or rubber reinforcing layer, Imamura provides multiple embodiments (Examples 4 and 5) in which the gauge of the end cover rubber is approximately 1 mm, which is well within the broad range of 0.05 to 5 mm defined by the claimed invention. As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ an end cover rubber in accordance to the limitations of the claimed invention, as suggested by Imamura, in the general tire construction defined by either one of

Bourdon or Farnsworth. This particular type of end cover rubber represents one of many conventional such rubbers used to prevent "belt end separation" and would have been readily appreciated by one of ordinary skill in the art.

(10) Response to Argument

Applicant initially contends that Gaudin teaches away from the claimed invention in that the breaker strip configurations are not disclosed as being generally applicable to all breaker strip configurations.

It is agreed that Gaudin describes a specific belt structure in which a high angled cord layer is disposed between an inner and outer low angle cord layer. However, in describing the axial widths of the respective belt layers, the teachings of Gaudin do not suggest that the plurality of belt assemblies depicted in Figures 6-11 are only specific to the disclosed construction. Applicant is pointed to Column 1, Lines 35-40 in which Gaudin states, "Furthermore in **belt design**, it is desirable to stagger the ply endings in the edge regions of the belt by employing plies of different widths. This gives a progressive reduction in stiffness and minimized stress concentration at the belt edge." This description suggests that a staggered belt assembly is beneficial for **belt designs** in general- it is by no means specific only to the belt design of Gaudin. This arrangement is well recognized in the tire industry. It is further noted that Farnsworth is consistent with these teachings, as depicted in Figures 3a-3c. While Farnsworth fails to depict all possible staggered assemblies, a fair reading of Farnsworth suggests that a plurality of belt constructions are within the scope of Farnsworth (evidenced by figures

of Farnsworth). Given the three-belt construction of Farnsworth, there are only 6 possible designs (regarding axial widths), three of which are expressly depicted in the above noted figures of Farnsworth. It is emphasized that Farnsworth fails to place a criticality on the specific staggering assembly but rather stresses the importance of a high angled, metal cord layer radially outside a pair of low angle, metal cord layers- <u>this is the same belt construction of the claimed invention</u>. Lastly, each of the six possible belt constructions is depicted by Gaudin (Figures 6-11) and described as "alternative arrangements"- it is clear from the description of each Figure that the reference is generally teaching the use of a staggered belt assembly in tire constructions (Column 3, Lines 35-45).

Applicant further argues that while Gaudin may teach a general desirability to stagger the plies, it does not teach one skilled in the art the particular way of doing so. The examiner respectfully disagrees. In fact, the reference specifically recognizes that each of the six possible belt configurations (with respect to varying axial widths), which are described as "alternative arrangements", provide suitable reinforcement (Figures 6-11). More particularly, Gaudin states, "these arrangements also provide improved edging rubber looseness characteristics for the heavy duty tire" (Column 3, Lines 30-35). Thus, it is evident that each of the six possible belt assemblies would have been well within the purview of one of ordinary skill in the art at the time of the invention.

In regards to the possible belt structures, applicant contends that there are an indefinite number of different possible designs, considering not only the belt width, but also the direction and inclination angle of the belt cord. As previously stated by the

examiner, given the belt construction of Farnsworth (as concerns the direction and cord angle), there are only six possible belt constructions, each of which is expressly depicted by Gaudin- in fact, Farnsworth actually depicts three of the six possible configurations. It is emphasized that Farnsworth does disclose the combination of three rubberized cord layers having the particular cord orientations recited in the claims, leaving the claimed axial width relationship as the only difference between Farnsworth and the claimed invention.

Regarding the widths of the layers, applicant contends that making the innermost layer wider than the outermost cord layer is effective to prevent the intrusion of cut failure generated in a place exceeding the widthwise end of the outermost cord layer (cut resistance is improved). Applicant points to the examples/data beginning on page 54 of the Specification. However, only Table 2 provides a relationship between the axial widths of the layers and the improvement in cut resistance. In this instance, the cut resistance is actually a maximum in Example 15 in which the outermost belt ply 3B has a width of 110 mm and the middle belt ply 2B has a width of 150 mm- this embodiment, though, does not satisfy the claimed ratio of the outermost ply having a width that is greater than the width of the middle ply (1.0-1.2 times as wide). Examples 17 and 18 of Table 2 are the only constructions that are commensurate in scope with the claims. These examples, though, are not persuasive in establishing an unexpected result for the claimed construction. In particular, the cut resistance is measured beneath a groove at a position equal to 100 mm (Page 58). In comparing Examples 17 and 18 to Comparative Examples 7 and 8, one would expect an increase in cut resistance (at a

position beneath a groove) because the outermost ply has a width smaller than and equal to the groove positioning. **It is evident from Table 2 that improved cut resistance is obtained by providing an outermost ply having a width greater than the position of the groove under which the property is measured- the table does not provide a showing of unexpected results for the outermost ply having a width between 1.0 and 1.2 times the width of the middle ply**. One of ordinary skill in the art at the time of the invention would expect the cut resistance to improve by extending a given layer to cover the point at which the resistance is measured (limited resistance if layer does not even extend to a point where resistance is measured). It is noted that each of Figures 3b and 3c of Farnsworth include a high angled outermost ply having a greater width than the middle layer.

As to the compression modulus, a fair reading of Kohno suggests that it is desired to form an outermost belt ply formed of steel cords with a coating rubber having a high modulus- the reference does not teach that such a high modulus coating rubber is specific to a circumferential belt layer. Furthermore, Kohno specifically teaches the use of such a high modulus coating rubber in an outermost belt ply formed of steel cords in order to prevent the cords of this belt layer from moving and causing local buckling of said cord (Column 4, Lines 47-55)- this is directly analogous to the benefits detailed by applicant (Page 9, 2nd Paragraph). Thus, Kohno evidences the use of a high modulus coating rubber in an outermost belt layer formed of steel cords for the benefits detailed above.

In summary, Farnsworth substantially teaches the claimed pneumatic tire construction, including a three-ply belt assembly formed of steel reinforcing elements, wherein the radially outermost ply is a high angle ply and the innermost and middle plies are low angle plies crossed with one another. As is well known in the tire industry and evidenced by Gaudin, it is extremely well known to stagger the ends of belt plies in a wide variety of configurations in order to eliminate the buildup of stresses (and the occurrence of belt end separation). Absent any conclusive showing of unexpected results, one of ordinary skill in the art at the time of the invention would have found it obvious to from the belt of Farnsworth with the staggered assembly defined by the claimed invention.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Justin Fischer
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May 31, 2005

Conferees

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